

WHAT IS CLAIMED IS:

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1. A mutant SPE-A toxin or fragment thereof, wherein the mutant has at least one amino acid change and is substantially nonlethal compared with a protein substantially corresponding to wild type SPE-A toxin.

2. A mutant SPE-A toxin according to claim 1, wherein the mutant SPE-A toxin comprises one to six amino acid substitutions; and

wherein at least one of the substituted amino acids is positioned in N-terminal alpha helix 3, in domain B beta strand 1, in domain B beta strand 2, in domain B beta strand 3, in domain A beta strand 6, in domain A beta strand 8, in domain A beta strand 9, in domain A beta strand 10, or is a cysteine.

3. A mutant SPE-A toxin according to claim 1, wherein the mutant SPE-A toxin comprises one to six amino acid substitutions; and

wherein at least one of the substituted amino acids is asparagine-20, aspartic acid 45, lysine-157, or cysteine-98.

4. The mutant SPE-A toxin of claim 3, wherein the at least one amino acid substitution comprises the substitution of asparagine-20 to aspartic acid, glutamic acid, lysine or arginine; the substitution of cysteine 98 to serine, alanine, glycine, or threonine; the substitution of lysine-157 to glutamic acid or aspartic acid; or the substitution of aspartic acid-45 to asparagine, glutamine, serine, threonine, or alanine.

5. The mutant SPE-A toxin of claim 4, wherein the at least one amino acid substitution comprises asparagine-20 to aspartic acid, cysteine 98 to serine, aspartic acid-45 to asparagine, or lysine-157 to glutamic acid.

6. The mutant SPE-A toxin of claim 3, wherein the at least one amino acid substitution comprises substitution of asparagine-20.

8. The mutant SPE-A toxin of claim 6, further comprising substitution of cysteine-98, or lysine-157.

9. The mutant SPE-A toxin of claim 8, wherein the substitution is cysteine 98 to serine, or lysine-157 to glutamic acid.

10 10. The mutant SPE-A toxin of claim 6, further comprising substitution of
cysteine-98 and aspartic acid-45.

11. The mutant SPE-A toxin of claim 10, wherein the cysteine-98 is substituted to serine and aspartic acid-45 is substituted to asparagine.

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12. The mutant SPE-A toxin of claim 1, wherein the mutant has at least one of the following characteristics: the mutant has a decrease in mitogenicity for T-cells, the mutant does not substantially enhance endotoxin shock, the mutant is not lethal, or the mutant is nonlethal but retains mitogenicity comparable to that of the wild

20 type SPE-A toxin.

13. A vaccine for protecting animals against at least one biological activity of wild-type SPE-A comprising: an effective amount of at least one mutant SPE-A toxin according to claim 1.

14. A pharmaceutical composition comprising: a mutant SPE-A according to claim 1 in admixture with a physiologically acceptable carrier.

15. A DNA sequence encoding a mutant SPE-A toxin according to claim 1.

16. A stably transformed host cell comprising a DNA sequence according to claim 15.

17. A method for protecting an animal against at least one biological activity of a wild type SPE-A comprising: administering a vaccine according to claim 13 to an animal.

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18. A method for reducing symptoms associated with toxic shock comprising:
administering a vaccine according to claim 13 to an animal.

Add B^3

add C'

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